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COCHYLIS CAULOCATAX RAZOWSKI (LEPIDOPTERA: TORTRICIDAE: COCHYLINI): A REDESCRIPTION OF THE MALE WITH NEW DESCRIPTIONS OF THE FEMALE, LARVA, AND PUPA

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Abstract.—*Cochylis caulocatax* Razowski was previously known only from the type series, 2 males, from Venezuela. The adults, male and female genitalia, larva, and pupa are described and illustrated. Larvae feed on stamens of *Eustoma grandiflorum* (Raf.) Shinners (Gentianales: Gentianaceae) in early instars, then burrow into ovaries feeding on developing seeds and supporting tissues. The moth is known from north central Kentucky, southeastern Texas, eastern Mississippi, south central Florida, and central Venezuela. Two generations per year occur in the Nearctic: 1) mid-June through July and 2) September to mid-October. Collections from Venezuela were in mid-February. Two parasites were reared, a braconid, *Bracon* sp., and a chalcidid, *Spilochalcis sanguiniventris* (Cresson).

Host plant and biological information on Nearctic Cochylini are poorly known. This can be attributed to the habitus of the larvae, boring in stalks, roots, seedheads, or pods of the host. Palaearctic species of *Cochylis* are most frequently found in the flowers and seedheads of Compositae. Other hosts include species of Dipsaceae, Scrophulariaceae, Campanulaceae, and Linaceae (Razowski, 1970). A series of the recently described *Cochylis caulocatax* Razowski was reared from *Eustoma grandiflorum* (Raf.) Shinners (Gentianales: Gentianaceae) by the junior author in Texas. Until now this species was known only from the type series, 2 males from central and east central Venezuela (Razowski, 1984).

Adults are illustrated with descriptions of the male, female, larva, and pupa. Means and standard deviations are given for all measurements. The letter "N" denotes number of specimens examined. Color names used are followed by a parenthetical number indicating colors under the system of Smithe (1975, 1981). Larval chaetotaxy follows Hinton (1946).

Cochylis caulocatax Razowski
Figs. 1–18

Cochylis caulocatax Razowski, 1984:278.

Adult male (Fig. 1). Length of forewing 3.3–4.8 mm ($\bar{x}$ = 4.3 ± 0.4 mm, N = 11).

HEAD. Labial palpus short, porrect, scales of middle segment expanded dorsally, ventral scales expanded almost to apex of apical segment, external scales tawny olive, internal scales cream (54); apical segment 0.7 length of basal segment; middle segment

2.1 length of basal segment, 0.9–1.0 times vertical eye diameter. Antennae filiform, 39–41 segments, scape and dorsal scaling tawny to tawny olive, setose ventrally.

THORAX. Mesonotum and tegula tawny olive; lateral scale tufts of metanotum and scales of scutellum cream to glaucous (80). Underside pale horn color (92); pro- and mesothoracic legs chestnut (32), tibia and tarsus suffused with varying amounts of black scales, tibia with faint apical rings; metathoracic leg pale horn color, tibial spurs and tarsus suffused with glaucous scales.

FOREWING. Length 2.5–2.9 times maximum width. Ground color tawny olive (223 D); elongate spot along costa from base to 0.25 wing length chestnut; distinct median band tawny (38), from costa to dorsum; faded subapical costal spot tawny; from middle of outer edge of median band a few jet black (89) scales form a broken line to basal edge of tornus; a few jet black spots along dorsum subbasally to edge of tornus; fringe tawny olive. Underside ground color blackish neutral gray (82), tawny along costa; fringe tawny olive, basal band tawny.

HINDWING. Length 3.8–4.2 mm ($\bar{x}$ = 3.9 ± 0.1 mm, N = 9); length 2.5–3.2 times maximum width. Upper side entirely white, some specimens with apex and terminal area suffused with glaucous (80); fringe white, a pale glaucous basal band present on specimens that are suffused with glaucous terminally. Underside white suffused with blackish neutral gray scales in and above discal cell to costa; area above Sc vein flushed with tawny; fringe concolorous with upperside.

ABDOMEN. Varying from entirely tawny olive to glaucous above and tawny below, with genital tuft tawny olive.

MALE GENITALIA (Figs. 3, 4). Uncus and gnathos absent. Tegumen short. Socii lobate, fused basally, attached to apex of tegumen. Transtilla a well developed band, medially produced into a curved process extending above tegumen. Valva triangulate, sacculus modified into a well sclerotized elongate spine. Vinculum arms free, with expanded lateral plates. Aedeagus ventrally deflected medially at a right angle, dorsolateral process at right angle; cornuti absent.

Adult female (Fig. 2). As described for male except as follows. Forewing length 4.2–5.3 mm ($\bar{x}$ = 4.8 ± 0.3 mm, N = 19); length 2.6–3.0 times maximum width. Hindwing length 3.8–4.6 mm ($\bar{x}$ = 3.9 ± 0.2 mm, N = 19); length 2.4–3.1 times maximum width. Hindwing upperside entirely blackish neutral gray; fringe white, lightly suffused with tawny olive and glaucous (80), basal band blackish neutral gray. Underside and fringe concolorous with upperside. Abdomen blackish neutral gray above and tawny olive below.

FEMALE GENITALIA (Fig. 5). Papilla analis thin, lightly sclerotized. Apophysis anterior with ventral arm reduced. Sterigma a well sclerotized half circle. Colliculum well developed, hour-glass shaped. Ductus bursae short, forming a small sac, with corpus bursae originating from just below sterigma. Accessory bursa present, originating laterally from ductus bursae just below sterigma.

Larva (Figs. 4–10). Length of larvae 4.3–6.8 mm ($\bar{x}$ = 5.4 ± 1.1 mm, N = 4).

HEAD. Hypognathous, maximum width 1.07 mm. Color uniformly burnt sienna (132) in alcohol. Puncture AFa slightly closer to AF2 than AF1. Puncture Pb slightly caudad from P1 and P2. Puncture Pa slightly closer to L1 than P2. Puncture Ga dorsal from G1 and 03. Six stemmata present with 4 and 5 contiguous. Mandible with 5 cusps, fifth reduced. Labrum with 4 pairs of dorsal setae, 3 pairs of ventral epipharyngeal setae.

Figs. 1, 2. *Cochylis caulocatax* Razowski, adults. 1. Male, TEXAS: Walker Co., vic. Huntsville, seed pods of *Eustoma grandiflorum* (Raf.) Shinners = bluebells, pods coll. 21–31.VIII, emerged 24–26.IX.1983, M. Moldenhauer, leg., T. Friedlander. 2. Female, same data as male except emerged 15.IX.1983.

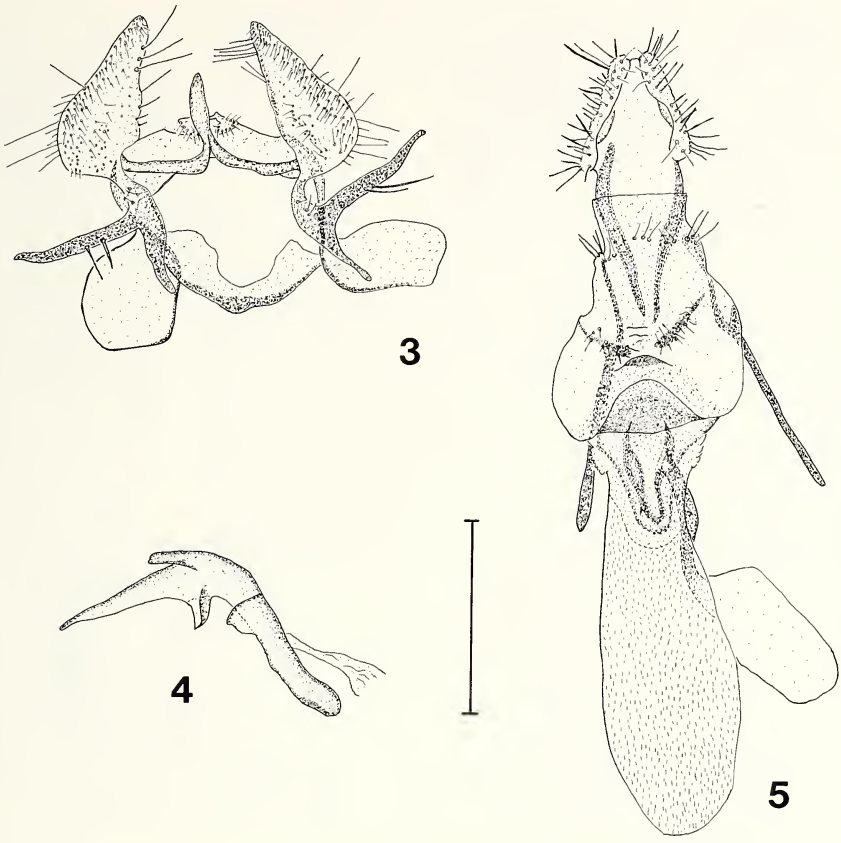
THORAX. Prothoracic shield unicolorous with head. Prothorax with L group on same pinaculum; mesothorax with L3 on separate pinaculum. Prothorax with SV1 and SV2 on same pinaculum; mesothorax with only SV1 present. Legs 3-segmented, single tarsal claw.

ABDOMEN. SD2 minute; ninth segment with D1 and SD1 on same pinaculum. Only SV2 on segment 8; SV3 absent from segment 9. Prolegs on segments 3–6 and 10; crochets on abdominal segments 3–6 uniordinal and arranged in a complete circle composed of approximately 30 spines; anal prolegs with crochets arranged in a semi-ellipse with 17 spines.

Pupa (Figs. 11–16). Male length 5.1–5.8 mm ($\bar{x}$ = 5.4 ± 0.4 mm, N = 4), maximum width 1.2–1.9 mm ($\bar{x}$ = 1.5 ± 0.4 mm, N = 3); female length 5.4–6.1 mm ($\bar{x}$ = 5.7 ± 0.3 mm, N = 7), maximum width 1.5–1.6 mm ($\bar{x}$ = 1.5 ± 0.04 mm, N = 6) (in alcohol). Eyes clearly visible. A row of minute posterior spines on abdominal segments 2–8 of male and 2–7 of female. A row of well developed anterior spines on segments 3–9 on both sexes. Spiracles are peg-shaped and protrude from abdominal segments 2–7. Antennal length equal to length of mesothoracic leg. Metathoracic leg protruding beyond wing tips. A single genital slit on a pad in middle of segment 9 in male. Female with 2 genital slits, one on posterior edge of segment 8, another on anterior edge of segment 9. Male cremaster with 4 hooks on anterior edge; two pair of lateral, and 2 caudal hooks on segment 10. Female cremaster with 4 hooks on anterior edge; two pair of anterolateral hooks, 2 lateral, and 2 caudal hooks on segment 10.

Type. Holotype male; in collection of United States National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Type locality. VENEZUELA: Bolivar, Morichal Tauca, 22 km E Rio Caura.



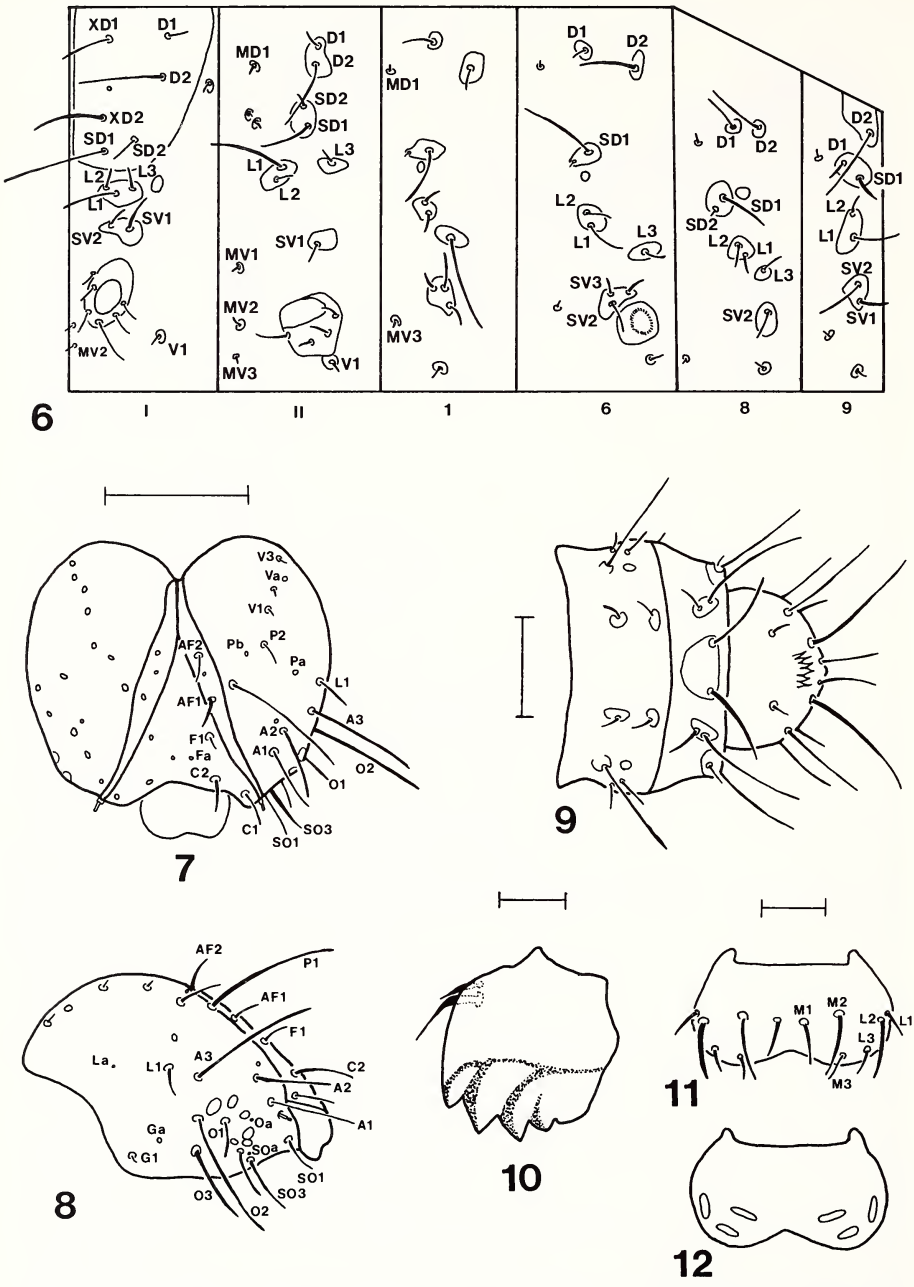
Figs. 3–5. *Cochylis caulocatax* Razowski, genitalia. 3. Ventral view of male, genitalia slide MGP 677. 4. Lateral view of aedeagus. 5. Ventral view of female, genitalia slide USNM 23453 (scale = 0.5 mm).

Host. Gentianaceae, *Eustoma grandiflorum* (Raf.) Shinners in the Nearctic; boring in seed pods. The host is unknown in Venezeula. *Eustoma* does not occur in the Neotropics. Another genus of Gentianaceae may be the host in Venezuela.

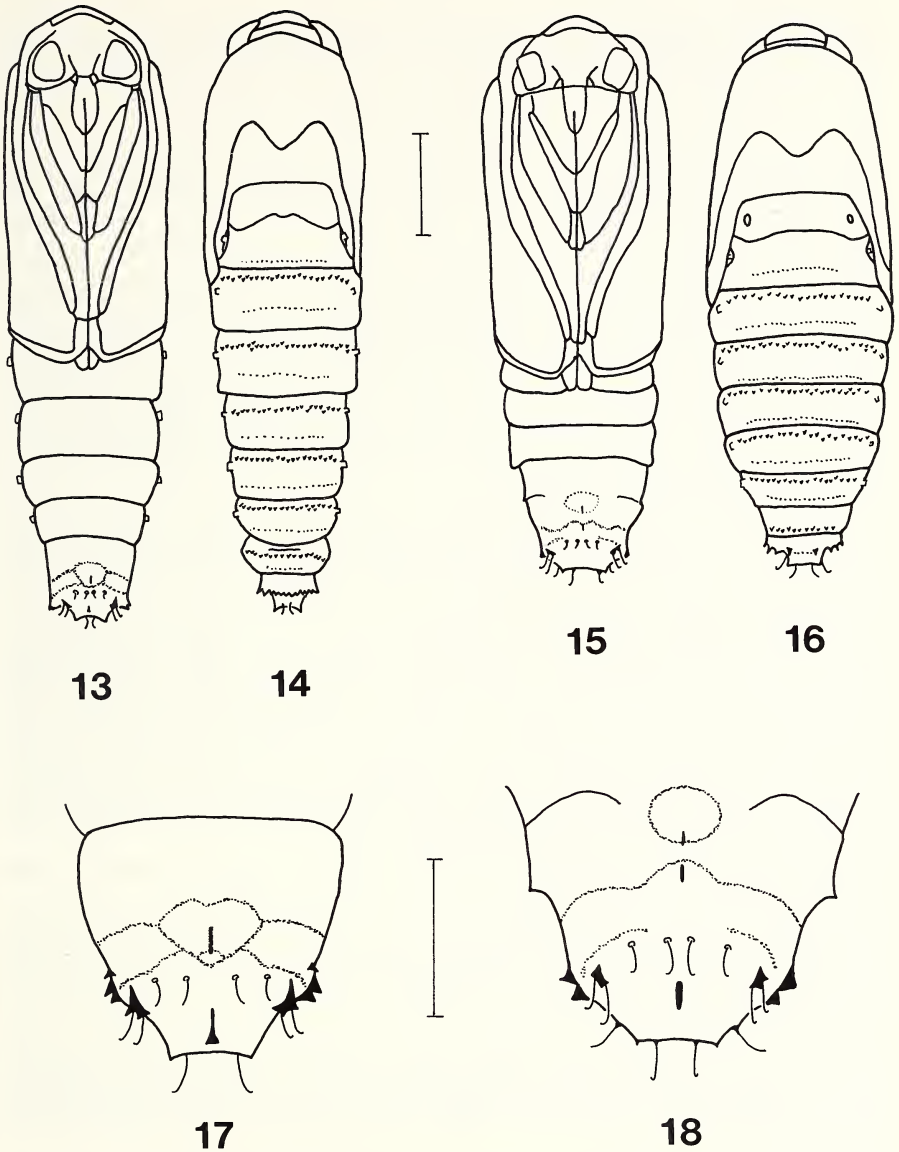
Flight period. There are at least 2 generations per year, mid-June through July, and September to mid-October. In Venezuela this species has only been collected from 8 to 13 February.

Distribution. North central Kentucky, southeastern Texas, eastern Mississippi, south central Florida, and central to east central Venezuela.

Material examined. 17 males, 28 females, 4 larvae, and 16 pupae. VENEZUELA: Bolivar: Morichal Tauca, 22 km E Rio Caura, 1 male (holotype), 8–9 Feb. 1976. Parque Llovizna, Rio Caroni, Cd. Guayana, 1 male (paratype), 13 Feb. 1976. UNITED STATES: FLORIDA: Highlands Co., Archbold Biological Station, 1 female, 9 July 1979. KENTUCKY: Hardin Co., Glendale, 1 male, 22 Aug.–3 Sept. 1975, malaise



Figs. 6–12. *Cochylis caulocatax* Razowski, larval chaetotaxy. 6. Lateral view of prothorax, mesothorax, and abdominal segments 1, 6, 8, and 9. 7. Dorsal view of head (scale = 0.5 mm). 8. Lateral view of head. 9. Dorsal view of abdominal segments 8–10. 10. Left mandible (scale = 0.1 mm). 11. Dorsal view of labrum (scale = 0.1 mm). 12. Ventral view of labrum.



Figs. 13–18. *Cochylis caulocatax* Razowski, pupae. 13. Ventral view of male. 14. Dorsal view of male. 15. Ventral view of female. 16. Dorsal view of female (scale = 1.0 mm). 17. Ventral view of male ultimate segment. 18. Ventral view of female ultimate segment (scale = 0.5 mm).

trap. MISSISSIPPI: Oktibbeha Co., 6 mi SW Starkville, 1 male, 21 Sept. 1984, 1 female, 11 June 1984. TEXAS: Cameron Co., S. Padre Island, 1 male, 1 Mar. 1978. Jackson Co., Deutschburg, 1 male, 8 Aug. 1973. Nueces Co., N. Padre Island, 1 male, 1 female, 21 June 1977; Padre Island National Seashore, 1 female, 19 May 1976, 1 female, 19 July 1976. San Patricio Co., Welder Wildlife Ref., 8 mi NE of Sinton, 1 male, 1 female, 29–30 July 1975. Walker Co., Huntsville, 1 male, 2 females, June 1983, *Eustoma grandiflorum.* vic. Huntsville, 9 males, 20 females, pods coll. 21–31 Aug. 1983, seed pods *Eustoma grandiflorum* (Raf.) Shinners = bluebells, emerged 8 Sept.–6 Oct. 1983.

Parasites. Two species were reared from *Cochylis caulocatax*, a braconid *Bracon* sp. and a chalcidid *Spilochalcis sanguiniventris* (Cresson). *S. sanguiniventris* is principally a primary parasite of Lepidoptera having been reared from 10 different families. It has also been reared from several species of Curculionidae (Coleoptera). It is also a secondary parasite on Braconidae and Ichneumonidae (Hymenoptera). *C. caulocatax* is a new host record for *S. sanguiniventris* (Krombein et al., 1979).

Biology. Cochylis caulocatax was reared from seed pods of *Eustoma grandiflorum* supplied by Marlene Moldenhauer.

Host plants bloom as early as mid-June, and some adults were observed in the spring. Eggs are probably deposited in flowers, perhaps also in developing flower buds. Larvae eat stamens (but not pistil) of the flower before burrowing into the ovary. With only 2 sizes of head capsules present in the seed pods, larvae apparently do not enter the ovary until the later instars. Larvae feed on developing seeds and tissues that supply nourishment to seeds more than in pod walls. Many damaged seed pods still produced some normal seeds. The last instar larva chews a hole, generally in the base, but occasionally in the top of one of 2 halves of the pod, leaving a thin skin of plant tissue through which the pupa emerges. A pupation chamber inside the pod is connected by a silk-lined tunnel to the exit hole. On emergence, the adult leaves the pupal skin protruding half way out of the exit hole. Adults emerge in early morning and are ready to fly at dusk.

Of 188 pods collected, 50 showed evidence of larval damage. At least 10% of the latter harbored more than one larva.

Discussion. The tawny olive ground color of the forewing of *Cochylis caulocatax* is shared with several undescribed species of Nearctic *Cochylis.* However, the well developed tawny median band and subapical costal spot are good characters to distinguish *C. caulocatax.*

Sexual dimorphism occurs in the hindwing color of about half the *Cochylis* species, with the female wing darker. The male genitalia possess 2 characters that identify *C. caulocatax*: 1) sacculus is modified into an elongate spine and 2) a dorsolateral process of aedeagus.

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